Positive Train Control (PTC) Full Working Group
May 14-15, 2002 - Colorado Springs, Colorado

May 14: Full Working Group Meeting convened at 8:30 a.m.

Note 1: The minutes and all of the meeting presentations will be posted on the Volpe Website at: http://imsserver.volpe.dot.gov. There are no user ID's or passwords required.

Note 2: If you connect through the FRA Website, rather than going directly to the Volpe Website, your User Name and User ID will be the first letter of your first name and all of your last name.

Filenames and their association with the presenters are as follows:

	Presenter & Organization	Filename (all Adobe PDF format)
1	Alan Polivka, TTCI Brian Caine, Lockheed Martin Frank Wilson, Wabtec Ken Jackson, Battelle	IDOT PTC RSAC 5-02 - Primary.pdf IDOT PTC RSAC 5-02 - Summary.pdf IDOT PTC RSAC 5-02 - Wilson.pdf
2	Dr. Ted Giras, University of Virginia	ASCAP 05-2002.pdf ASCAP Chart.pdf
3	Bob Dorer - Volpe Allen Bing, PhD - ICF Consulting Dr. Sherry Borener - Volpe Dr. Ted Giras, University of Virginia John Wreathall - The WreathWood Group	Risk Assessment - Dorer.pdf Risk Assessment - Bing.pdf Risk Assessment - Borener.pdf Risk Assessment - Giras.pdf Risk Assessment - Wreathall.pdf
4	Rich McCord - FRA	PTC Preventable Accidents.pdf
5	Ed Dobranetski - NTSB	See Attachment #1
6	Bill Petit - Safetran Systems	ITS.pdf

There is an attachment embedded in these minutes. The table below depicts this attachment.

Attachment #	Contents	Person Submitting
Attachment #1	NTSB Preventable Collisions	Ed Dobranetski - NTSB

- Cindy Gross called to order the Full Working Group at 8:30 a.m. with a safety briefing. Ms. Gross asked the Full Working Group to review the minutes of the December 2001 meeting. There were no changes to the minutes and Robin Buxton made a motion that the minutes stand as published and Bill Petit made the second motion.

- Ted Bundy made an announcement that a sign-in sheet will be passed around the meeting room which lists each person's name and e-mail address. Please make any changes to your email address.

There was also a discussion as to the date of the next meeting, and it was decided that the meeting would be held the week of October 21st. October 21 will be for travel; the meeting will begin October 22, with the length of time to be established on Wednesday Nashville is the first choice and Baltimore/Annapolis is the second choice for the meeting location.

- Ted Bundy announced to the group that we had arranged for conference call-in capability and that when you addressee the group that you state your name and your organization. John Vogler, New Jersey Transit and Larry Light, Amtrak, introduced themselves as conference call-ins.

- Alan Polivka led a progress update briefing on the North American Joint (Illinois) PTC Project. He was followed in the presentation by Brian Caine of Lockheed Martin, who briefed the group on the IDOT PTC System Developer/Integrator which included the Current Program Highlights, System Integration and Test Status, Safety Program Status, and Program Schedule of the North American Joint Project.

- Joe Mattingly told Brian he was concerned about whether disarrangement of the system was being fully considered. Mr. Caine asked what Mr. Mattingly meant by disarrangement, and Mr. Mattingly responded that it was a commonly used term to describe when a part of a system has been taken out and replaced, and then testing of those components has to be accomplished to ensure that the block covered has been restored. Mr. Caine responded that they call that regression testing, and that they provide for testing not only the entire system but also each separate module of the system to ensure each of them functions as intended whenever something is replaced.

- Bob Harvey asked Brian Caine, "in addition to the four aspect cab signal system, what other elements have been identified that could be affected by human factors in the system". Mr. Harvey followed up by asking did this include automatic train stop. Alan Polivka answered that it did, and asked Ted Giras to respond in more detail. Dr. Ted Giras, added that two of the UVA people had worked at Union Switch & Signal in the past, and were very familiar with the four aspect US&S cab signal system being used as the IDOT PTC base case.

- George Achakji, Transport Canada, asked what system was used in location determination. Brian Caine said the system uses a combination of GPS, DGPS, inertial sensors, and gyroscopes. Joe Mattingly asked how that solved the problem of adjacent track tracking (location determination). Alan Polivka said this was done primarily by the gyro, which is extremely sensitive and is tied into a track database, which then lets the system determine which track is involved by means of characteristics such as curves and turnouts. He added that switch positions are monitored for this purpose as well.

- Bob Dorer asked, "Does the system require human input to determine which track the train is on, and if the wrong track is entered, does the system then correct itself automatically?" Bill Moore Ede said that the system does require human input in certain cases and the train will only be offered tracks that are reasonable, and the system checks this against track occupancies known by the office system. If the system determines that an incorrect path is being followed or about to be followed, the system alerts the operator and if appropriate action is not taken, will enforce to a stop. The train could then be reverted back to the core, or underlying method of operation (e.g., TCS).

- Robin Buxton asked if the PSP covered all of the data radios. Alan Polivka responded that the safety analysis addresses all aspects of the system, identifying and focusing on the safety critical elements. Ms. Buxton asked if labor could take a look at the PSP. Mr. Polivka said that he did not see why not.

- Frank Wilson made a presentation on the NAJPTC locomotive equipment. Bob Harvey asked what would happen if one of the two display screens failed; had a determination been made on what the surviving screen would display? Mr. Polivka said they were still working on that, and no decision had yet been made. ***Note: The photographs Mr. Wilson used are available on the Volpe Web Site, under the file name IDOT PTC RSAC 5-02 - Wilson.pdf***
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- Ken Jackson, Battelle, briefed the group on the IDOT PTC Safety Working Group progress. Frank Roskind said that the hazard log mentioned by Mr. Jackson didn't appear to be the same one that was specified in the NPRM. Ken Jackson said that this was a separate hazard log that was necessary during the design process, and that he was sorry for any confusion that may exist because there are, in effect, two hazard logs.

  Fred Gamst said that, as an anthropologist, he thought a mistake had been made by not bringing the employees in as stakeholders at the beginning of the project, and he wasn't sure that bringing in a few operating employees in the middle of the project was the best way to do it. Ken Jackson said that there were employees brought in to provide input into the specifications, but he couldn't respond beyond that. Bill Moore Ede said that in developing the initial displays, they relied more heavily in using experts with past experiences to do this, but there really wasn't any close interaction with labor when the specifications were developed. Alan Polivka said that this is a good point and the program will take this into consideration.

- Dr. Ted Giras, UVA, ASCAP briefing and the ASCAP Panel. A color chart titled "Axiomatic Safety - Critical Assessment Process (ASCAP++) Toolset Overview" was distributed to the group. ***Note: This chart will be part of the minutes or electronic documentation available on the Volpe web site ASCAP Chart.pdf.***

Bob Harvey asked if the ASCAP model takes into account that you only go through a few feet, or a hundred feet, e.g. - a human may see signal and not react in time, and to pass the signal by 5 feet would result in different risk factors or consequence factors. Dr. Giras said they would have look at different logs so that we can speak to the issues that you are referring to.

Tom Raslear followed up by saying that he didn't think that Bob Harvey's question was fully answered. Mr. Raslear said that he thought Bob was asking whether or not the ASCAP model actually reflected reality. Ted Giras answered by saying that this was an age old problem, and that we have to have the expert opinions of Bob Harvey or people like him, run the scenarios by them, and ask them whether or not they seem to adequately address what exists in the workplace.

- Grady Cothen mentioned an outstanding issue from the December 2001 meeting in San Antonio - suggestion by someone that the best technology that is compliant with the rule should be used as the base case for risk assessment. Someone had commented that the NAJPTC project should use automatic train control as the base case because of the use of public funds and the fact that passenger trains would be involved, and this is the most advanced current technology compliant with the rules. Mr. Cothen said the December meeting minutes point to an AAR document

expressing concern with that philosophy, and gave as an example their concern that adjustment of a base case could provide a mechanism for back door regulation. He said that since then, in meetings with AAR, the following have transpired:

- FRA told AAR and the NAJPTC folks that we understood that they were "well into" the current project, and FRA thought that the UP's US&S four aspect cab signal system with automatic train stop could suffice as a good starting point.
- FRA will develop and share with AAR some scenarios and examples of how FRA thought they could play out.
- This is something that FRA believes must be resolved.
- To restate, FRA's feeling is that from a technical standpoint this is a very important issue. We don't know how to make existing base cases work, when there are significant changes being planned in operations and infrastructure. There will be changes to track structure, increasing speeds, changing the mix of trains, adding trains, and all of these things will make it significantly different from what currently exists, and all of these things need to be considered. He said there is a real trap here for ourselves if we're not careful. The risk on the line today is relatively low because of the low train density, low speeds, etc., so the frequency and potential severity are much less than what will exist. Mr. Cothen concluded by saying that FRA would be feeding additional data sets to Ted Giras for use in the ASCAP model.

George Achakji from Transport Canada said that they shared this view with Mr. Cothen, and they also felt that risk assessment was not something that could stand alone in this regard.

- Robin Buxton stated that the employees are the ones that run the railroad and if it doesn't work, the employees are the ones who fix and modify the system. So, she wanted Ted Giras to know that he shouldn't leave labor out of the equation.

- **The group broke for lunch at 11:25 a.m.**

- **The meeting reconvened at 1:00 p.m.**

- Bob Dorer began his moderation of the risk assessment panel by giving a brief overview of what risk assessment is overall, what it is particular to the 20 components mentioned in the NPRM for Part 236(h), and his perception of how FRA wants it to be applied to the PTC development process.

Note: Each of the four risk assessment panelists gave a brief dissertation of their perspective of risk assessment methodologies. Some of these methodologies are based on current methods used by their organizations. All of the perspectives are captured in the files mentioned in the table at the beginning of these minutes. There was no attempt made to recapture these dissertations in the minutes. Although the recorder of the minutes attempted to keep track of the discussions, it was difficult to record even the basics of the various interactions between the panelists and the working group. We attempted to capture the gist of what we deemed to be more important issues, but make no claim to having captured everything that should have been.

The risk assessment panelists made their individual dissertations in the following order: Allen Bing, Sherry Borener, Ted Giras, and John Wreathall. Questions specific to a particular presentation were answered, with the understanding that, at the end of the individual discussions, the risk assessment panel answered questions from the moderator and audience as a group. Following are the results.

- After she had completed her presentation, Howard Moody asked Sherry Borener to clarify what she meant by characterizing only derailments, only collisions, etc. Ms. Borener answered that this wasn't what she said; she said that you need to look at all of the variables that may affect a particular corridor, including corridors that have the same attributes. Mr. Moody, addressing Grady Cothen, said that he didn't think we wanted to get into a situation where we were trying to assign attributes to corridors when assessing risk.

- Ron Lindsey asked the panel to elaborate on how risk assessment could be of value to a system such as CBTM, which is not a PTC system but does provide a higher level of safety than a non-signaled system. The answer seemed to be that for that kind of a system you would have to rely more heavily on analysis of qualitative values to analyze, rather than quantitative.

- Bob Harvey stated that he didn't think organizational failures, such as not taking timely action to correct faults, "killing the messenger", etc., were being given the weight they should. John Wreathall responded that these kinds of organizational failures did create problems.

- Robin Buxton asked John Wreathall when he was going to use roadway worker input in the work he is doing. He advised the question should be posed to those who wrote his contract specifications, so Grady then answered, eventually asking Robin to help FRA by providing them with specifics on what FRA should be doing to include this group.

- Joe Mattingly asked the panel whether a risk assessment should focus on qualitative factors, quantitative factors, or both. The answer seemed to be that you would focus on both, but that qualitative factors were more important.

- **Meeting adjourned at 4:20 p.m.**

May 15: Full Working Group Meeting convened at 8:30 a.m.

- Rich McCord, FRA, gave a PTC Preventable Accident Analysis overview**.**

- Ed Dobranetski, NTSB, gave a Perspective on NTSB Safety Recommendations. ***See Attachment #1.***

- Bill Petit, Safetran, gave a briefing on the ITS-HRC Interface work being done by IEEE.

- Grady Cothen, stated that after yesterday's Risk Assessment feedback, he believed it would be beneficial to establish a small team to address some of the issues mentioned. He recommends that the Risk-2 Team(?) consist of and focus on the following:

  - Other than ASCAP risk issues
  - Small group/consult by telephone or e-mail where possible
  - Assist VOLPE Center in structuring data runs off CRAM platform
  - Be in standby status to address Base Case issue for final rule
  - Assist in structuring guidance materials for risk scenario development under the final rule

The group consists of the following members:

Labor	AAR	Others	Suppliers	FRA
Robin Buxton Tim DePaepe Fred Gamst	Larry Milhon Howard Moody Bob Ralph	George Achakji	Bill Petit (POC)	Rich McCord 1 other

Cindy Gross asked the group for their approval of the formation of the Risk 2 Team Membership and consensus was reached .

Ted Bundy discussed with the group the agenda for the October 2002 meeting which will consist of full days on October 22 and 23. The agenda will include the following items:

- Update briefings on the six PTC projects, if possible. (NAJPTC, NJT ACES, ATK ACSES, ATK ITCS, CSX CBTM, BNSF-Quantum Train Sentinel System)
- Briefing from the RISK-2 Team.
- ASCAP
- Human Factors

Meeting adjourned at 10:30 a.m.

List of Participants:

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Attachment #1

NATIONAL TRANSPORTATION SAFETY BOARD

OFFICE OF RAILROAD, PIPELINE, AND HAZARDOUS MATERIALS INVESTIGATIONS

RAILROAD DIVISION

WASHINGTON, D.C. 20594

POSITIVE TRAIN CONTROL PREVENTABLE COLLISIONS

MAY 15, 2002

The FRA's Railroad Safety Advisory Committee in 1997 established a working group to address positive train control. Among other objectives, the group is attempting to address the current Federal regulations and their applicability to new train control systems under development and to draft new regulations as necessary. The working group has also done preliminary work to identify specific rail corridors where a positive train control system would have the greatest impact.

On March 30, 2001, the FRA responded that it was taking every action within its program authority and available budget authority to advance the deployment of technology that will achieve Positive Train Control (PTC) and related safety functions, which together are referred to as PTC.

The Safety Board is aware that recently, Amtrak began phased revenue implementation of the Advanced Civil Speed Enforcement System on its Northeast Corridor, providing PTC functionality by working in concert with the cab signal/automatic train control system. As a result, Amtrak, commuter, and freight trains are now benefitting from features that provide positive stops at home signals, civil speed enforcement, and protection of roadway workers; and Amtrak trains are authorized to operate up to 150 mph in territory with all trains equipped. Amtrak (funded by the State of Michigan and FRA), New Jersey Transit, and the FRA (with Illinois, Amtrak, and UP) are implementing and testing other PTC technology. These projects will help build confidence in the readiness of advanced train control technology, while delivering enhanced safety on heavily used passenger corridors.

Successfully implementing PTC systems on the larger freight railroad network will require the availability of reliable and affordable technology that is compatible with other emerging Intelligent Railroad Systems. As noted above, using any reasonable set of estimates the safety benefits of PTC are significantly outweighed by the costs. Accordingly, other benefits must be integrated into the business plans of the railroads in order to facilitate implementation. Several major railroads are already procuring highly capable computer-aided dispatching systems that can work in synergy with future PTC systems, and the FRA is encouraging acquisition of "forward-compatible" technology that can work as a part of or in harmony with PTC systems in the future. Railroads are also beginning implementation of allied technologies, including DGPS and GPS tracking of locomotives to enhance power management.

The Safety Board issued its first positive train separation/control systems safety recommendation (R-87-16) following its investigation of the collision between a commuter train and a freight train near Brighton, Massachusetts, on May 7, 1986. Since then the Board has investigated 40 collisions that may have been prevented had a fully implemented PTC system been in place. Prior to 1986, 60 collisions were investigated that may also have been preventable had a fully implemented PTC system been in place. At that time the Board generally referenced advanced train control systems. These numbers do not include Board accident investigations that have not yet been adopted and published by the Board or accidents that the Board has not investigated. At this time the Board has 11 open accident investigations that involve collisions,

which include the recent accident in California of April 23, 2002. (See appendix for accidents investigated.)

The Safety Board currently has 8 Safety Recommendations in an "OPEN" status that are related to Positive Train Control. The recipient and their Safety Recommendation are stated below: (see appendix for safety recommendations.)

Railway Progress Institute – R-93-15
Association of American Railroads—R-94-16; R-97-39; R-97-40; R-97-41
CSX Transportation – R-97-26
Federal Railroad Administration – R-01-6 **(MW)**; R-01-21

The recommendation for a Positive Train Control system has been on the Safety Board's **MOST WANTED** list since its inception in 1990. The first Safety Recommendations issued on positive train control, specifically Safety Recommendations R-87-16, R-93-13, and R-97-12, were classified "Closed—Acceptable Action/Superseded" as a result of the issuance of Safety Recommendation, R-01-6, that was adopted in the Board's report of the Bryan, Ohio accident report on May 9, 2001.

R-01-6

> The National Transportation Safety Board recommends that the Federal Railroad Administration: Facilitate actions necessary for development and implementation of positive train control systems that include collision avoidance and require implementation of positive train control systems on main line tracks. Establish priority requirements for high-risk corridors such as those where commuter and intercity passenger railroads operate.

The Safety Board has acknowledged progress in this area. The Safety Board received a response to R-01-6 from the FRA on March 27, 2002. In the response the FRA provide a copy of the Notice of Proposed Rulemaking entitled "Standards for Development and Use of Processor-Based Signal and Train Control Systems," that was published in the *Federal Register* on Friday, August 10, 2001. FRA also indicated it is taking a lead role as the sponsoring agency within the USDOT for the Nationwide Differential Global Positioning System (NDGPS) Network. In addition FRA reported that they are working with the Volpe National Transportation Systems Center toward completion of the Corridor Risk Assessment Model (CRAM). FRA also reported they are undertaking the necessary testing and evaluations to confirm the integrity of the various PTC demonstration programs.

The Safety Board believes that customer demands for improved service quality and capacity constraints will drive the railroad industry toward advanced train control and traffic management systems.

The following is a listing of all the train collision accidents investigated by the Board with a reference to the published accident report. Most of the recent accidents are available on the Safety Boards Internet web site at www.ntsb.gov/railroad/railroad.htm.

National Transportation Safety Board. 2001. Rear-End Collision of National Railroad Passenger Corporation (Amtrak) Train P286 With CSXT Freight Train Q620 on the CSX Railroad at Syracuse, New York. February 5, 2001 Railroad Accident Report NTSB/RAR-01/04.

The Safety Board has long been a proponent of automated systems that prevent train collisions by automatically interceding in the operation of a train when the engineer does not comply with the requirements of the signal indication. The found that had Amtrak train 286 been equipped with such a system, the system would have intervened by slowing the train when the train engineer failed to slow in response to passing the *restricting* signal indication, whether or not the engineer misinterpreted or missed seeing the signal. The Safety Board concluded that had a fail-safe safety redundancy system such as positive train control been installed and operational throughout the accident area, the accident would probably not have occurred.

Title: Collision of Consolidated Rail Corporation (Conrail) Train KAEL-3 and Union Pacific (UP) Train ZYCMX-23 in Momence, Illinois, March 23, 1999 **NTSB Report Number:** RAB-02-02, adopted on 03/14/2002

The National Transportation Safety Board determined that the probable cause of the collision was the failure of the Conrail engineer, despite the crew's difficulty in seeing the home signal, to slow the train enough to be able to stop it before it entered the crossing. Contributing to the accident was the conductor's delayed action in warning the engineer to slow the train even though the conductor realized that the train might be traveling too fast to stop at the crossing. Also contributing to the accident was the lack of any safety redundancy system capable of preventing a collision in the event of human failure.

Title: Railroad Accident Report: Collision Involving Three Consolidated Rail Corporation Freight Trains Operating in Fog on a Double Main Track near Bryan, Ohio, January 17, 1999
NTSB Report Number: RAR-01-01, adopted on 05/09/2001 **NTIS Report Number:** PB2001-916301

Again the Safety Board found that a fully implemented positive train control system would have prevented Mail-9 from passing the *stop and proceed* indication at signal 3351W and striking the

rear car of TV-7.

Title: Collision, Central Kansas Railway, Geneseo, Kansas, July 16, 1998 **NTSB Report Number:** RAB-98-25, adopted on 12/01/1998

The National Transportation Safety Board determined that the probable cause of this accident was that the Hutchinson North Switcher train crewmembers allowed their train to enter and proceed along the main track without first obtaining track warrant authority and the Central Kansas Railway management's lack of operational safety oversight.

Title: Railroad Accident Report Collision of Norfolk Southern Corporation Train 255L5 with Consolidated Rail Corporation Train TV 220 Butler, Indiana March 25, 1998
NTSB Report Number: RAR-99-02, adopted on 07/13/1999

A fully implemented positive train separation system would have prevented this accident.

Title: Rear-end Collision/Derailment, Conrail, Hummelstown, Pennsylvania, September 29, 1997 NTSB **Report Number:** RAB-98-23, adopted on 12/01/1998

The National Transportation Safety Board determined that the probable cause of the accident was a phantom signal indication that resulted because the Consolidated Rail Corporation failed to ensure that the signal aspects displayed could be properly seen by train crews.

Title: Collision Between Union Pacific Freight Trains MKSNP-01 and ZSEME-29 Near Delia Kansas July 2, 1997 **NTSB Report Number:** RAR-99-04, adopted on 08/31/1999

A fully implemented positive train separation control system would have prevented the collision at the Union Pacific Kenefick siding, thus saving the life of the NP-01 engineer.

Title: Collision and Derailment of Union Pacific Railroad Freight Trains 5981 North and 9186 South in Devine, Texas on June 22, 1997 NTSB **Report Number:** RAR-98-02, adopted on 05/19/1998

Had a positive train separation control system been installed and working in the Devine accident area, the two trains would not have been allowed to enter the same block of track traveling in opposite directions and, as a result, the head-on collision on June 22, 1997, would not have occurred.

Title: Rear-end Collision, Missouri and Northern Arkansas Railroad, Branson Scenic Railroad, Branson, Missouri, May 14, 1997 NTSB **Report Number:** RAB-98-03, adopted on 04/23/1998

On May 14, 1997, about 9:00 p.m., central daylight time, a Missouri and Northern Arkansas Railroad (M&NA) train, the Cotter North local, was traveling northbound in non-signaled territory when it entered a siding track and collided with an unattended and unoccupied Branson Scenic Railway (BSR) excursion train. The collision occurred in downtown Branson, Missouri, on the M&NA Aurora Subdivision at milepost (MP) 447.3. When the collision occurred, the lead locomotive unit of the striking train derailed and caught fire. Also, both locomotive units of the parked train derailed.

Title: Rear-end Collision, Union Pacific Railroad Company, Odem, Texas, February 21, 1997
NTSB Report Number: RAB-98-02, adopted on 04/23/1998

The National Transportation Safety Board determines that the probable cause of this accident was that the crew of train BVFW-20 was inattentive to their duties and failed to ascertain that the rear of their train was not clear of the yard limits in Odem, Texas. Contributing to the accident was the incorrect consist information supplied by the clerk.

Title: Rear-End Collision, Southern Pacific Transportation Company, Beaumont, California, August 30, 1996 NTSB **Report Number:** RAB-98-14, adopted on 08/18/1998

The National Transportation Safety Board determines that the probable cause of this accident was the engineer and the conductor of the striking train mistakenly interpreted the restricted signal indication to be clear because of sun glare.

Title: Head-on Collision, Trains Q317-19 and Q316-18, CSXT Railroad, Smithfield, West Virginia, August 20, 1996 NTSB **Report Number:** RAB-98-13, adopted on 08/18/1998

The National Transportation Safety Board determines that the probable cause of this accident was failure of the crew of eastbound train Q316-18 to comply with the DTC authorization despite receiving and confirming the information from the dispatcher.

Title: Collision/Derailment, Gateway Western Railway, Pleasant Hill, Illinois, May 12, 1996
NTSB Report Number: RAB-98-10, adopted on 08/18/1998

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the conductor and engineer of Extra 2037 West to provide adequate protection for the rear end of the train and ensure that the rear end of the train did not obstruct the main track.

Title: Light-Rail Vehicle Rear-End Collision, Southeastern Pennsylvania Transportation Authority, Philadelphia, Pennsylvania, March 11, 1996 NTSB **Report Number:** RAB-98-09, adopted on 08/18/1998

The National Transportation Safety Board determines that the probable cause of this accident was failure of the operator of LRV 9037 to comply with the 10-mph speed restriction and his failure to stop at the stop signal located 297 feet from the point of the collision because he was inattentive.

Title: Collision and Derailment of Maryland Rail Commuter MARC Train 286 and National Railroad Passenger Corporation AMTRAK Train 29 Near Silver Spring, MD February 16, 1996 **NTSB Report Number:** RAR-97-02, adopted on 06/17/1997 **NTIS Report Number:** PB97-916302

A fully implemented positive train separation control system would have prevented this accident by recognizing that MARC train 286 was not being operated within allowable parameters, based on other authorized train operations, and would have stopped the train before it could enter into the unauthorized track area.

Title: Railroad Accident Report Near Head-on Collision and Derailment of Two New Jersey Transit Commuter Trains Near Secaucus, New Jersey February 9, 1996 **NTSB Report Number:** RAR-97-01, adopted on 03/25/1997 **NTIS Report Number:** PB97-916301

The National Transportation Safety Board determines that the probable cause of New Jersey Transit (NJT) train 1254 proceeding through a stop indication and striking another NJT commuter train was the failure of the train 1254 engineer to perceive correctly a red signal aspect because of his diabetic eye disease and resulting color vision deficiency, which he failed to report to New Jersey Transit during annual medical examinations. Contributing to the accident was the contract physician's use of an eye examination not intended to measure color discrimination.

The NJT has indicated that it is attempting to expedite a capital program in which all of its rail lines will be equipped for either cab signals or positive train stop by December 31, 1997, and all NJT lines will be equipped with both technologies by December 31, 2001. The Safety Board recognizes and commends the efforts of the NJT to improve its system safety.

Title: Railroad Accident Report Collision of Washington Metropolitan Area Transit Authority Train T-111 with Standing Train at Shady Grove Passenger Station, Gaithersburg, Maryland January 6, 1996 **NTSB Report Number:** RAR-96-04, adopted on 10/29/1996 **NTIS Report Number:** PB96-916304

The November 17, 1995, notice instructing Operations Control Center controllers that they were not

to permit train operators to change from automatic to manual mode constituted a change to *Metrorail Safety Rules and Procedures Handbook* rule 3.85, and in issuing the notice, WMATA management failed to comply with its own established formal procedures for making changes to operating rules.

The Safety Board is fully aware of statistics indicating that some 80 percent of all transportation accidents are attributable to human error. The Safety Board itself has been at the forefront of efforts to promote the use of automated systems in all transportation modes— such as positive train separation systems in the railroad industry—that will reduce absolute reliance on operating personnel to ensure safe operations. The Safety Board further acknowledges evidence that, since the opening of the Metrorail system, most accidents and incidents have been caused by human operators rather than by the automated operating system. Nevertheless, the Safety Board believes that total faith in technology, no matter how advanced and sophisticated that technology may be, is inappropriate and that technology should instead be approached with a high degree of informed caution. WMATA top management did not display that caution; instead it encouraged among Metrorail employees a degree of confidence in the ATC system that was wholly unjustified given the system's built-in limitations (discussed elsewhere in this analysis). Had those officials had less faith in the reliability and inherent safety of the automatic train control system, they may have considered their options more carefully before mandating automatic train operation in all weather conditions. Having done so, they may have become aware of the limitations of the system and may have put procedures in place to accommodate them. In effect, WMATA officials took such steps after the accident when they issued Special Order 96-2 requiring that, in inclement weather, performance levels limiting train speeds to a maximum of 49 mph be entered and confirmed for all Metrorail route segments. If this special order had been issued before the accident and if it had been understood and followed, this accident may not have occurred. The Safety Board concludes that WMATA management failed to fully understand the design features and limitations of the ATC system, which led to unjustified management confidence that the system could ensure safe train operation under all operating conditions.

Title: Railroad Accident Report Collision Involving Two New York City Subway Trains on the Williamsburg Bridge in Brooklyn, New York June 5, 1995 **NTSB Report Number:** RAR-96-03, adopted on 09/04/1996 **NTIS Report Number:** PB96-916303

The current design of the NYCT signal system does not provide sufficient safeguards against accidents caused by operator error. The Board found that this accident was caused by the failure of the train operator to comply with the stop indication because he was asleep and the failure of the train to stop within the block because of inadequate braking distance between signals on the Williamsburg Bridge.

Title: Collision and Derailment of Two Subway Trains Metropolitan Transportation Authority New York City Transit in Brooklyn, New York, on February 9, 1995

NTSB Report Number: RAR-96-01, adopted on 03/19/1996 **NTIS Report Number:** PB96-916301

The track section on which the collision occurred lacked a true positive train separation system because the automatic stop arm did not prevent the M train from passing signal D2-532.

The Safety Board has long been an advocate of train control systems that provide positive train separation (PTS) and has included PTS on its list of "Most Wanted Transportation Safety Improvements." The PTS system provides an automatic means of backing up the actions of the train operator by monitoring the performance of operator and train when approaching the limits of a signal or speed restriction. Should the operator or the train fail to apply the proper brake action, the PTS system will assume control, automatically apply the brakes, and stop the train. The newer transit agencies in San Francisco, California; Atlanta, Georgia; and Washington, DC, use PTS systems to control train speed and separation. The NYCT relies on the stop arm to prevent collisions as well as on the operator's understanding of and compliance with operating rules. The collision just south of the Ninth Avenue station demonstrates the limitations of this NYCT control system. The Safety Board concludes that the track section on which the collision occurred lacked a true PTS system because the automatic stop arm did not prevent the M train from passing signal D2-532. Therefore, the Safety Board believes that the NYCT should include over speed protection and PTS in the modernization of its signal system.

The National Transportation Safety Board determines that the probable cause of the rear-end collision between the two subway trains was the inadequate oversight and compliance program of the Metropolitan Transportation Authority/New York City Transit to ensure that train operators comply with the published operating rules. Contributing to the collision was the design modification to the automatic key-by feature of the automatic stop arm that enabled the operator of the M train to pass a stop signal contrary to the published operating rules that require stopping at a red signal unless permission to pass is granted by Rapid Transit Operations.

Title: Collision and Derailment Involving Three Burlington Northern Freight Trains near Thedford, Nebraska June 8, 1994. **NTSB Report Number:** RAR-95-03, adopted on 09/07/1995
NTIS Report Number: PB95-916303

A fully implemented positive train separation control system would have prevented this accident. The Board determined that the probable cause of the accident was the failure of the engineer or OWY 9062 East to obey the restrictive signal indication because based on this inappropriate reliance on peripheral cues, he anticipated the signal would change; and the inattentiveness of the conductor of OWY 9062 East to train operations because of fatigue. Contributing to the accident were the fatigue of the engineer of OWY 9062 East, which adversely affected his judgment and the manner in which he operated his train; the use of the restricted proceed signal indications; and the lack of a positive train separation control system.

Title: Rear-End Collision of Atchison, Topeka and Santa Fe Railway Freight Train PBHLA1-10 and Union Pacific Railroad Freight Train CUWLA-10 Near Cajon, California December 14, 1994 **NTSB Report Number:** RAR-95-04, adopted on 11/21/1995 **NTIS Report Number:** PB95-916304

The Board determined that the collision of the two freight trains was the result of insufficient available train braking force for the Santa Fe train due to an undetermined restriction or blockage in the train line between the third and fourth articulated cars.

Title: Head-On Collision and Derailment of Burlington Northern Freight Train with Union Pacific Freight Train Kelso, Washington November 11, 1993. **NTSB Report Number:** RAR-94-02, adopted on 11/15/1994 **NTIS Report Number:** PB94-916302

The accident would have been prevented had the trains been controlled by a fully implemented positive train separation control system. All potential benefits of positive train separation need to be identified and included in any cost benefit analysis of positive train control systems. The Board determined that the cause of the accident was the failure of the BN crewmembers, for unknown reasons, to see the intermediate signal that would have directed them to stop at the absolute signal and the lack of redundancy in the CTC system. Contributing to the accident was the lack of a positive train separation control system.

Title: Collision between Northern Indiana Commuter Transportation District Eastbound Train 7 and Westbound Train 12 Near Gary, Indiana, on January 18, 1993. **NTSB Report Number:** RAR-93-03, adopted on 12/07/1993 **NTIS Report Number:** PB93-916304

The collision between the two trains could have been prevented had a positive train separation system been in place and operational.

Title: Knox, Indiana - September 17, 1991 **NTSB Report Number:** RAR92-02*, adopted on 09/28/1992 **NTIS Report Number:** PB92-916303

The train crew demonstrated a lack of vigilance and crew coordination in failing to stop at a STOP signal.

Title: Head-On Collision between Burlington Northern Railroad Freight Trains 602 and 603 Near Ledger, Montana August 30, 1991. **NTSB Report Number:** RAR-93-01, adopted on 05/25/1993 **NTIS Report Number:** PB93-916301

The principle of safely and successfully operating more than one train on a given railroad segment

is predicated on the establishment of a system that will keep trains separated. A system to ensure positive train separation has for many years been a Board concern and has been on the "Most Wanted" list. With either ARES or ATCS in effect the TW would nave appeared on a cab-mounted screen, and with a fully implemented system would have automatically limited the train from advancing beyond Ledger. The Board concluded that had an ATCS been installed and working in the accident area, the accident probably would have been prevented. The Board concluded that the development of a practical positive train separation system has not progressed as quickly as it should have.

Title: Rear-End Collision Involving Two Greater Cleveland Regional Transit Authority Trains Near the West 98th Street Station Cleveland, Ohio, July 2, 1991 **NTSB Report Number:** RAR93-01, adopted on 04/27/1993 **NTIS Report Number:** PB93-916305

The Board found that the GCRTA was not making optimal use of its investment in a state-of-the-art train control system when it uses the technology ineffectively. The accident was the result of inadequate oversight of train operations and inconsistent enforcement of the operating rules by the GCRTA and the subsequent; unauthorized deactivation of the ATC system by the train's operator.

Title: Derailment and Collision of Amtrak Passenger Train 66 with MBTA Commuter Train 906 at Back Bay Station Boston, Massachusetts December 12, 1990. **NTSB Report Number:** RAR-92-01, adopted on 02/25/1992 **NTIS Report Number:** PB92-916301

The Board determined that the cause of the accident was the failure of the apprentice engineer to reduce speed in sufficient time to negotiate the curve into the Back Bay station as a result of inadequate supervision. Contributing to the accident was the failure of Amtrak to have advance-warning devices for speed reduction for the curve entering the station.

Title: Atchison, Topeka and Santa Fe Railway Company (ATSF) Freight Trains ATSF 818 and ATSF 891 on the ATSF Railway Corona, California November 7, 1990. **NTSB Report Number:** RAR-91-03, adopted on 07/23/1991 **NTIS Report Number:** PB91-916303

Notwithstanding the failure of the crewmembers of train 818 to comply with the stop signal on the west end of the Corona siding, the accident probably would have been prevented had the carrier been using a positive train separation system. If an ATCS had been monitoring the location, speed, and handling of train 818, the dispatch computer would have recognized the fluctuation in speed from San Bernardino to Corona and the engineer's failure to take action to brake as the train moved closed to the stop signal. The railroad industry and the FRA must expedite the development of positive train separation systems.

Title: Collision and Derailment of Norfolk Southern Train 188 with Norfolk Southern Train G-38 at Sugar Valley, GA August 9, 1990. **NTSB Report Number:** RAR-91-02, adopted on 07/09/1991 **NTIS Report Number:** PB91-916302

This accident would have been prevented had the trains been separated by a fully implemented advanced train control system. The Board realizes that much remains to be done before a complete ATCS can be implemented. Nonetheless, this is another accident that could have been averted had the ATCS system been available and installed. With transponders to monitor the train's location and speed and to provide moving braking distance parameters and information about how the train was being handled, the dispatch computer would have recognized that the train was not going to stop at the signal. The dispatch computer, through the data radio link, would have order the locomotive's computer to stop the train, thus preventing the collision. The Board urged the industry and the FRA to expedite the developments and use of the ATCS.

Title: Rear-end collision of two New York City Transit Authority Trains 103rd Street Station, New York, New York March 10, 1989. **NTSB Report Number:** RAR-90-01, adopted on 03/13/1990 **NTIS Report Number:** PB90-916301

The Board determined that the cause of the accident was the improper application of a jumper wire in the signal circuitry. Contributing was the failure of NYCTA management to require proper repairs to the signal circuit in a timely manner. Also, the operation of the train into the station at a speed in excess of the posted speed, in part the result of the failure of NYCTA management to furnish a reasonable means for operators to determine speed.

Title: Head-on collision between Iowa Interstate Railroad Extra 406 East with release of Hazardous Materials near Altoona, Iowa, July 30, 1988. **NTSB Report Number:** RAR-89-04, adopted on 07/06/1989 **NTIS Report Number:** PB89-916304

The Board determined that the cause of this accident was the failure of the crew to comply with the wait provisions of the issued train order and inadequate enforcement of the operating rules by the carrier. The signal system had been removed. The Board also found inadequate surveillance and enforcement of compliance with carrier and Federal regulations by the FRA.

Title: Collision of Amtrak Train 66, The Night Owl with on-track maintenance- of-way equipment, Chester, Pennsylvania January 29, 1988. **NTSB Report Number:** RAR-89-01, adopted on 01/06/1989 **NTIS Report Number:** PB89-916301

The Board determined that the cause of the accident was the failure of the tower operator due to impairment by drugs or distraction or both, to operate the switch to allow the train to crossover and

the failure of Amtrak to provide positive protection for on-track equipment and out-of-service tracks.

Title: Head-End Collision of Consolidated Rail Corporation Freight Trains UBT-506 and TV-61 Near Thompsontown, Pennsylvania January 14, 1988. **NTSB Report Number:** RAR-89-02, adopted on 02/14/1989 **NTIS Report Number:** PB89-916302

The crew failed to comply with the restrictive wayside and cab signals approaching Thompsontown and ran through the interlocking. No effort was made to stop the train before the collision. The wayside signal system was operating properly. Contributing to the accident ws the failure of the engineer to adequately reduce the speed of this train in conformance with a restricting cab signal and the inability of the dispatcher to recognize the emergency because of the inadequacies in the computer-based traffic control system.

Title: Rear-End Collision of Amtrak Massachusetts Bay Transportation Authority Commuter Trains, Boston, Massachusetts, November 12, 1987. **NTSB Report Number:** RAR-88-05, adopted on 11/10/1988 **NTIS Report Number:** PB88-916306

The automatic train control system on train 8114 did not provide positive separation between the trains. These same types of ATCS are being used on most Amtrak units operating on the NEC. Further, these systems are being installed on those locomotive units that are not equipped with such devices. These ATCS will stop a train if the engineer fails to take appropriate action. However, they also permit a train to be operated at a speed up to 20 mph, through the stop and proceed or stop wayside signal indications, if the train speed has been reduced below 20 mph and the engineer has also acknowledged the audio warning of the cab signal change. That is, if the engineer acknowledges the cab signal change and reduces the speed of his train to below 20 mph, the train will not be automatically stopped by the ATCS. Furthermore, the suppression feature of the system will permit the engineer to use power and brakes event when a situation requires braking only. Because of these limitations, the ATCS does not comply fully with the intent of the Board's previous recommendation—R-87-1: Immediately initiate a program which will assure that all locomotives operating on the high speed passenger train trackage of the NEC are equipped with a device which will control the train automatically as required by the signal if the engineer fails to do so.

Title: Collision and Derailment of Amtrak Train 6 on the Burlington Northern Railroad, Russell, Iowa October 12, 1987. **NTSB Report Number:** RAR-88-04, adopted on 07/19/1988
NTIS Report Number: PB88-916305

The Board determined the cause of this accident was the failure of a track laborer to restore the stub track switch (train operating against current of traffic without signal protection) to the mainline

track, the failure of the crane operator and track foreman to check the position of the stub track switch and the failure of the BN operating management to restrict the speed of trains through a work area and to check the condition of the switch banner. The Amtrak train collided with an unoccupied self-powered track crane.

Title: Head-on Collision of Southern Pacific Transportation Company Freight Trains, Yuma, Arizona June 15, 1987. **NTSB Report Number:** RAR-88-02, adopted on 05/24/1988
NTIS Report Number: PB88-916303

During its investigation the Board found many instances of signal system malfunctions in the Yuma yard. The signals were repeatedly "failing safe" before the accident and continued to do so on at least two occasions after the accident. Main track switches were routinely left improperly lined in the yard. The Board determined the cause was the engineer's failure to operate his train at restricted speed, while under the influence of alcohol, and the failure of the conductor to assure the safe operation of the train. The SP failed to properly supervise its operating employees.

Title: Rear End Collision and Derailment of Two Union Pacific Freight Trains Near North Platte, Nebraska on July 10, 1986. **NTSB Report Number:** RAR-87-03, adopted on 07/23/1987
NTIS Report Number: PB87-916303

The Board determined that it was the failure of the engineer to recognize the dangerous operating conditions imposed by the dense fog and reduce speed accordingly and his failure to reduce speed in accordance with signal indication as required by the operating rules. The Board stated that the UP contributed by failing to properly supervise operating employees and to correct the false restrictive signals on the subdivision which resulted in the engineer disregarding the valid signal indications on the main track. The UP does not have ATS nor regularly monitor event recorders to determine the engineer's compliance with signal indications.

Title: Rear-End Collision Between Boston and Main Corporation Commuter Train No. 5324 and Consolidated Rail Corporation Train TV-14, Brighton, Massachusetts, May 7, 1986. **NTSB Report Number:** RAR-87-02, adopted on 04/28/1987 NTIS **Report Number:** PB87-916302

The Board determined that this accident was the result of the failure of the engineer to properly interpret and comply, due to inattention or distraction; with the speed restriction mandated by the stop and proceed aspect of a wayside signal located to the rear of the struck train. The Board issued Safety Recommendation R-87-16, which stated—"Promulgate Federal standards to require the installation and operation of a train control system on mainline tracks which will provide for a positive separation of all trains."

Title: Head-on Collision of CSX Transportation Freight Trains Extra 4443 North and Extra 4309

South, East Concord, New York February 6, 1987. **NTSB Report Number:** RAR-88-03, adopted on 06/07/1988 **NTIS Report Number:** PB88-916304

The Board found in this accident that the CSX management failed to issue and enforce procedures for train crews to verify the accuracy of train orders before departing East Salamanca, which permitted the undetected inadvertent transmittal of train orders to the wrong station.

Title: Rear-End Collision of Amtrak Passenger Train 94, The Colonial and Consolidated Rail Corporation Freight Train ENS-121, on the Northeast Corridor, Chase, Maryland January 4, 1987. **NTSB Report Number:** RAR-88-01, adopted on 01/25/1988 **NTIS Report Number:** PB88-916301

The Board found the cause of this accident to be the failure, as a result of impairment from marijuana, of the engineer of CR to stop his train in compliance with the home signal before it fouled the track and the failure of the FRA and Amtrak to require and CR to use automatic safety backup devices on all trains on the NEC. Contributing was the brakeman's failure to observe signals and alert the engineer; failure of crew to make automatic cab signal tests before departure; muting of the alerter; and, inadequate FRA oversight of Amtrak's and CR's supervision of corridor trains.

The following are accidents investigated by the National Transportation Safety Board before safety recommendations concerning positive train separation/control systems were issued.

Title: Rear-End Collision of Two Greater Cleveland Regional Transit Authority Red Line Rapid Transit Trains near the 98th Street Station, Cleveland, Ohio July 10, 1985. **NTSB Report Number:** RAR-87-01, adopted on 04/14/1987 **NTIS Report Number:** PB87-916301

Title: Rear End Collision of Metro-Dade Transportation Administration Trains Nos. 172-171 and 141-142, Miami, Florida, June 26, 1985. **NTSB Report Number:** RAR-86-03, adopted on 08/05/1986 **NTIS Report Number:** PB86-916304

Title: Head-On Collison of Burlington Northern Railroad Company Freight Trains Extra 6311 West and Extra 6575 East, near Westminister, Colorado, August 2, 1985. **NTSB Report Number:** RAR-86-02, adopted on 06/20/1986 **NTIS Report Number:** PB86-916303

Title: Head-On Collision of Chicago, South Shore and South Bend Railroad Trains Nos. 123 and 218, Gary, Indiana, January 21, 1985. **NTSB Report Number:** RAR-85-13, adopted on 10/21/1985 **NTIS Report Number:** PB85-916313

Title: Collision of Seaboard System Railroad Train No. F-481 with Standing Cars, Robbins, South Carolina, February 25, 1985. **NTSB Report Number:** RAR-85-12, adopted on 10/16/1985 **NTIS**

Report Number: PB85-916312

Title: Rear End Collision of Two Chicago Transit Authority Trains near the Montrose Avenue Station, Chicago, Illinois, August 17, 1984. **NTSB Report Number:** RAR-85-11, adopted on 08/20/1985 **NTIS Report Number:** PB85-916311

Title: Head On Collision of National Railroad Passenger Corporation (Amtrak) Passenger Trains Nos. 151 and 168, Astoria, Queens, New York, NY, July 23, 1984. **NTSB Report Number:** RAR-85-09, adopted on 05/14/1985 **NTIS Report Number:** PB85-916309

Title: Head On Collision of Burlington Northern Railroad Freight Trains Extra 6760 West and Extra 7907 East, near Motley, Minnesota, June 14, 1984. **NTSB Report Number:** RAR-85-06, adopted on 04/30/1985 **NTIS Report Number:** PB85-916306

Title: Head On Collision of Burlington Northern Railroad Freight Trains Extra 6714 West and Extra 7820 East Wiggins, Colorado, April 13, 1984. **NTSB Report Number:** RAR-85-04, adopted on 04/01/1985 **NTIS Report Number:** PB85-916304

Title: Rear End Collision Between Conrail Trains OIPI-6 and ENPI-6X, near Saltsburg, Pennsylvania, February 26, 1984. **NTSB Report Number:** RAR-85-02, adopted on 02/04/1985 **NTIS Report Number:** PB85-916302

Title: Rear End Collision of Seaboard System Railroad Freight Trains Extra 8051 North and Extra 1751 North, Sullivan, Indiana, September 14, 1983. **NTSB Report Number:** RAR-84-02, adopted on 05/15/1984 **NTIS Report Number:** PB84-916302

Title: Rear End Collision of Two Burlington Northern Railroad Company Freight Trains Pacific Junction, Iowa, April 13, 1983. **NTSB Report Number:** RAR-83-09, adopted on 12/01/1983 **NTIS Report Number:** PB83-916309

Title: Head On Collision of Amtrak Trains Extra 769 East and No. 195, Bristol, Pennsylvania, March 29, 1982. **NTSB Report Number:** RAR-82-05, adopted on 08/26/1982 **NTIS Report Number:** PB82-916305

Title: Rear End Collision of Louisville and Nashville Railroad Company Trains No. 586 and Extra 8072 North, New Johnsonville, TN, Dec. 28, 1981. **NTSB Report Number:** RAR-82-04, adopted on 08/23/1982 **NTIS Report Number:** PB82-916304

Title: Side Collision & Derailment of Norfolk & Western Railway Company Trains Nos. 6BS78, Yard Shifter, and 67HNP, Crewe, VA, Nov. 28, 1981. **NTSB Report Number:** RAR-82-03, adopted on 05/18/1982 **NTIS Report Number:** PB82-916303

Title: Rear End Collision of New York City Transit Authority Subway Trains 142NL and 132NL, Brooklyn, New York, July 3, 1981. **NTSB Report Number:** RAR-82-02, adopted on 05/14/1982 **NTIS Report Number:** PB82-916302

Title: Head On Collision of Boston & Maine Corp Extra 1731 East & MBTA Train No. 570 on Former Boston & Maine Corp. Tracks, Beverly, Massachusetts, August 11, 1981. **NTSB Report Number:** RAR-82-01, adopted on 03/09/1982
NTIS Report Number: PB82-916301

Title: Rear End Collision of Union Pacific Railroad Company Freight Trains Extra 3119 West and Extra 8044 West near Kelso, California, November 17, 1980. **NTSB Report Number:** RAR-81-07, adopted on 08/18/1981 **NTIS Report Number:** PB82-109331

Title: Head On Collision Between Baltimore and Ohio Railroad Company Train No. 88 and the Brunswick Helper near German- town, Maryland, February 9, 1981. **NTSB Report Number:** RAR-81-06, adopted on 05/27/1981 **NTIS Report Number:** PB81-218877

Title: Head End Collision of Amtrak Passenger Train No. 74 and Conrail Train OPSE-7 Dobbs Ferry, New York, November 7, 1980. **NTSB Report Number:** RAR-81-04, adopted on 04/28/1981 **NTIS Report Number:** PB81-204869

Title: Rear End Collision of Union Pacific Railroad Company Freight Trains near Hermosa, Wyoming, October 16, 1980. **NTSB Report Number:** RAR-81-03, adopted on 04/07/1981
NTIS Report Number: PB81-195448

Title: Side Collision of Norfolk & Western Railway Company Train No. 86 with Extra 1589 West, near Welch, West Virginia, September 6, 1980. **NTSB Report Number:** RAR-81-02, adopted on 03/04/1981 **NTIS Report Number:** PB81-180093

Title: Rear End Collision of Septa Conrail Trains Nos. 406 and 472 on Conrail Track North Wales, Pennsylvania, July 17, 1980. **NTSB Report Number:** RAR-80-11, adopted on 12/23/1980 **NTIS Report Number:** PB81-163230

Title: Head On Collision of B & O Freight Trains Extra 6474 and Extra 4367 West, Orleans Road, West Virginia, February 12, 1980. **NTSB Report Number:** RAR-80-09, adopted on 09/02/1980
NTIS Report Number: PB81-105702

Title: Head On Collision Between Amtrak Train No. 82 and Seaboard Coast Line Extra 2771 South, Lakeview, North Carolina, April 2, 1980. **NTSB Report Number:** RAR-80-08, adopted on 09/02/1980 **NTIS Report Number:** PB81-104085

Title: Head End Collision of Nine Burlington Northern Loco Units with a Standard Freight Train, Angora, Nebraska, February 16, 1980. **NTSB Report Number:** RAR-80-07, adopted on 08/12/1980 **NTIS Report Number:** PB80-219082

Title: Rear End of Conrail Commuter Trains, Philadelphia, Pennsylvania, October 16, 1979.
NTSB Report Number: RAR-80-05, adopted on 05/12/1980 **NTIS Report Number:** PB80-191182

Title: Head End Collision of Amtrak Train No. 392 and ICG Train No. 51, Harvey, Illinois, October 12, 1979. **NTSB Report Number:** RAR-80-03, adopted on 04/03/1980 **NTIS Report Number:** PB80-181118

Title: Rear End Collision of Consolidated Rail Corporation Freight Trains ALPG-2 and APJ-2, near Royersford, Pennslyvania, October 1, 1979. **NTSB Report Number:** RAR-80-02, adopted on 02/14/1980 **NTIS Report Number:** PB80-162977

Title: Rear End Collision of Southern Pacific Transportation Company Freight Trains 02-Holat-21 and 01-BSMFK-20, Thousand Palms, California, July 24, 1979. **NTSB Report Number:** RAR-80-01, adopted on 02/14/1980 **NTIS Report Number:** PB80-158231

Title: National Railroad Passenger Corp. (Amtrak) Head End Collision of Train No. 111 and Plasser Track Machine Equipment, Edison, NJ, April 20, 1979. **NTSB Report Number:** RAR-79-10, adopted on 09/13/1979 **NTIS Report Number:** PB80-108673

Title: Rear End Collision of Two Union Pacific Freight Trains, Ramsey, Wyoming, March 29, 1979. **NTSB Report Number:** RAR-79-09, adopted on 08/16/1979 **NTIS Report Number:** PB-299961/AS

Title: Rear End Collision of Two Consolidated Rail Corporation Freight Trains, Muncy, Pennsylvania, January 31, 1979. **NTSB Report Number:** RAR-79-06, adopted on 08/02/1979 **NTIS Report Number:** PB-299962/AS

Title: Rear End Collision of Conrail Commuter Train No. 400 and Amtrak Passenger Train No. 60, Seabrook, Maryland, June 9, 1978. **NTSB Report Number:** RAR-79-03, adopted on 03/08/1979 **NTIS Report Number:** PB-294710/AS

Title: Head End Collision of Louisville and Nashville Railroad Local Freight Train and Yard Train at Florence, Alabama, September 18, 1978. **NTSB Report Number:** RAR-79-02, adopted on 02/22/1979 **NTIS Report Number:** PB-293326/AS

Title: Head On Collision of Two Greater Cleveland Regional Transit Authority Trains, Cleveland Ohio, July 8, 1977. **NTSB Report Number:** RAR-78-02, adopted on 02/09/1978 **NTIS Report Number:** PB-278191/AS

Title: Rear End Collision of Two Conrail Freight Trains, Stemmers Run, Baltimore, Maryland, June 12, 1977. **NTSB Report Number:** RAR-78-01, adopted on 01/26/1978 **NTIS Report Number:** PB-277990/AS

Title: Rear End Collision of Two Chicago Transit Authority Trains, Chicago Illinois, February 4, 1977. **NTSB Report Number:** RAR-77-10, adopted on 11/29/1977 **NTIS Report Number:** PB-277961/AS

Title: Head On Collision of Two Norfolk Western Railway Company Freight Trains, New Haven,

Indiana, October 19, 1976. **NTSB Report Number:** RAR-77-06, adopted on 08/05/1977 **NTIS Report Number:** PB-294649/AS

Title: Rear End Collision of Two Greater Cleveland Regional Transit Authority Trains, Cleveland, Ohio, Aug. 18, 1976. **NTSB Report Number:** RAR-77-05, adopted on 08/04/1977 **NTIS Report Number:** PB-294648/AS

Title: Collision of Two Consolidated Railroad Corp. Commuter Trains, New Canaan, Connecticut, July 13, 1976. **NTSB Report Number:** RAR-77-04, adopted on 05/19/1977 **NTIS Report Number:** PB-294643/AS

Title: Head On Collision of Two Penn Central Transportation Company Freight Trains near Pettisville, Ohio, Feb. 4, 1976. **NTSB Report Number:** RAR-76-10, adopted on 09/10/1976 **NTIS Report Number:** PB-258721/AS

Title: Chicago Transit Authority Collision of Trains No. 104 and No. 315 at Addison Street Station, Chicago, Illinois, January 9, 1976. **NTSB Report Number:** RAR-76-09, adopted on 07/08/1976 **NTIS Report Number:** PB-256693/AS

Title: Collision of Penn Central Transportation Company-Operated Passenger Trains Number 132, 944, and 939, near Wilmington, Delaware, October 17, 1975. **NTSB Report Number:** RAR-76-07, adopted on 06/16/1976 **NTIS Report Number:** PB-255651/AS

Title: Rear End Collision of Three Massachusetts Bay Transportation Authority Trains, Boston, Massachusetts, August 1, 1975. **NTSB Report Number:** RAR-76-05, adopted on 04/14/1976 **NTIS Report Number:** PB-253360/AS

Title: Rear End Collision of an Alaska Railroad Freight Train with a Passenger Train, near Hurricane, Alaska, July 5, 1975. **NTSB Report Number:** RAR-76-03, adopted on 02/19/1976 **NTIS Report Number:** PB-251489/AS

Title: Penn Central Transportation Company Train Collisions, Leetonia, Ohio, June 6, 1975. **NTSB Report Number:** RAR-76-02, adopted on 02/17/1976 **NTIS Report Number:** PB-251149/AS

Title: Rear-End Collision of Two Texas and Pacific Railway Company Freight Trains, Meeker, Louisiana, May 30, 1975. **NTSB Report Number:** RAR-75-9, adopted on 12/30/1975 **NTIS Report Number:** none

Title: Collision of Two Penn Central Commuter Trains at Botanical Garden Station, New York, New York, January 2, 1975. **NTSB Report Number:** RAR-75-08, adopted on 07/16/1975 **NTIS Report Number:** PB82-171588

Title: Collision of St. Louis/San Francisco Railway Trains 3210 and 3211, Mustang, Oklahoma, September 1, 1974. **NTSB Report Number:** RAR-75-06, adopted on 05/07/1975 **NTIS Report Number:** PB-242771/AS

Title: Collision of Missouri Pacific Railroad Company Freight Train Extra 615 South with a Standing Locomotive, Cotulla, Texas, December 1, 1973. **NTSB Report Number:** RAR-74-03, adopted on 06/27/1974 **NTIS Report Number:** PB-234191/AS

Title: Collision of the State-of-the-Art Transit Cars with a Standing Car, High Speed Ground Test Center, Pueblo, Colorado, August 11, 1973. **NTSB Report Number:** RAR-74-02, adopted on 05/01/1974 **NTIS Report Number:** PB-233254/AS

Title: Rear End Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1973. **NTSB Report Number:** RAR-74-01, adopted on 03/20/1974 **NTIS Report Number:** PB-231134/AS

Title: Texas and Pacific Work Extra 523/ Missouri Pacific Extra 1902 East, Head On Collision, Taft, Louisiana, February 21, 1973. **NTSB Report Number:** RAR-73-06, adopted on 0/25/1973 **NTIS Report Number:** PB-225080/1

Title: Collision of Illinois Central Gulf Railroad Commuter Trains, Chicago, Illinois, October 30, 1972. **NTSB Report Number:** RAR-73-05, adopted on 06/28/1973 **NTIS Report Number:** PB-221766

Title: Head On Collision of Two Burlington Northern Freight Trains near Maquon, Illinois, May 24, 1972. **NTSB Report Number:** RAR-73-04, adopted on 04/11/1973 **NTIS Report Number:** PB-220815

Title: Head On Collision of Two Penn Central Freight Trains at Herndon, Pennsylvania, March 12, 1972. **NTSB Report Number:** RAR-73-03, adopted on 03/14/1973 **NTIS Report Number:** PB-220110

Title: Illinois Central Railroad Company and Indiana Harbor Belt Railroad Company Collision Between Yard Trains at Riverdale, Illinois, on Sept. 8, 1970. **NTSB Report Number:** RAR-71-03, adopted on 11/24/1971 **NTIS Report Number:** PB-206325

Title: Penn Central Company, Collision of Trains N-48 and N-49 at Darien, Connecticut, August 20, 1969. **NTSB Report Number:** RAR-70-03, adopted on 10/14/1970 **NTIS Report Number:** PB-196053

Title: New York Central Railroad Company, Train 1/NY-4 Extra 2020 East and Train ND-5 Extra 5305 West, Head-On Collision, New York City, New York, May 22, 1967. **NTSB Report Number:** RAR-, adopted on 12/29/1967 **NTIS Report Number:** PB-190198

TABLE OF COLLISIONS INVESTIGATED BY NTSB SINCE 1986

Railroad	Location	Date
AMTRAK/CSXT	SYRACUSE, NY	2/5/2001
CR/UP	MOMENCE, IL	3/3/1999
CR	BRYAN, OH	1/17/1999
CKR	GENESEO, KS	7/16/1998
NS	BUTLER, IN	3/25/1998
CR	HUMMELSTOWN, PA	9/29/1997
UP	DELIA, KS	7/2/1997
UP	DEVINE, TX	6/22/1997
MNAR/BSRR	BRANSON, MO	5/14/1997
UP	ODEM, TX	2/21/1997
SP	BEAUMONT, CA	8/30/1996
CSXT	SMITHFIELD, WV	8/20/1996
GWR	PLEASANT HILL, IL	5/12/1996
SEPTA	PHILADELPHIA, PA	3/11/1996
MARC/AMTRAK	SILVER SPRING, MD	2/16/1996
NJT	SECAUCUS, NJ	2/9/1996
WMATA	SHADY GROVE, MD	1/6/1996
NYCTA	BROOKLYN, NY	6/5/1995
NYCTA	BROOKLYN, NY	2/9/1995
BN	THEDFORD, NE	6/8/1994
ATSF/UP	CAJON, CA	1/14/1994
BN/UP	KELSO, WA	11/11/1993
NICTD	GARY, IN	1/18/1993
NS	KNOX, IN	9/17/1991
BN	LEDGER, MT	8/30/1991
GCRTA	CLEVELAND, OH	7/2/1991
AMTRAK/MBTA	BOSTON, MA	12/12/1990
ATSF	CORONA, CA	11/7/1990
NS	SUGAR VALLEY, GA	8/9/1990
NYCTA	NEW YORK, NY	3/10/1989
IAIS	ALTOONA, IA	7/30/1988
AMTRAK	CHESTER, PA	1/29/1988
CR	THOMPSONTOWN, PA	1/14/1988
MBTA	BOSTON, MA	11/12/1987
AMTRAK	RUSSEL, IA	10/12/1987
SP	YUMA, AZ	6/15/1987
UP	NORTH PLATTE, NE	7/10/1986
BM/CR	BRIGHTON, MA	5/7/1986
CSXT	EAST CONCORD, NY	2/6/1987
AMTRAK/CONRAIL	CHASE, MD	1/4/1987

TABLE OF COLLISIONS INVESTIGATED BY NTSB PRIOR TO 1986

Railroad	Location	Date
BN	WESTMINSTER, CO	8/2/1985
GCRTA	CLEVELAND, OH	7/10/1985
METRO-DADE	MIAMI, FL	6/26/1985
SEABOARD	ROBBINS, SC	2/25/1985
CSS&SB	GARY, IN	1/21/1985
CTA	CHICAGO, IL	8/17/1984
AMTRAK	QUEENS, NY	7/23/1984
BN	MOTLEY, MN	6/14/1984
BN	NEWCASTLE, WY	4/22/1984
BN	WIGGINS, CO	4/13/1984
CR	SALTSBURG, PA	2/26/1984
SEABOARD	SULLIVAN, IN	9/14/1983
BN	PACIFIC JCT., IA	4/13/1983
LN	NEW JOHNSONVILLE, TN	12/28/1981
NW	CREWE, VA	11/28/1981
BM/MBTA	BEVERLY, MA	8/11/1981
NYCTA	BROOKLYN, NY	7/3/1981
B&O	GERMANTOWN, MD	2/9/1981
UP	KELSO, CA	11/17/1980
AMTRAK/CR	DOBBS FERRY, NY	11/7/1980
UP	HERMOSA, WY	10/16/1980
N&W	WELCH, WV	9/6/1980
SEPTA	WALES, PA	7/17/1980
AMTRAK/SCL	LAKEVIEW, NC	4/2/1980
BN	ANGORA, NE	2/16/1980
B&O	ORLEANS ROAD, WV	2/12/1980
CR	PHILADEPHIA, PA	10/16/1979
AMTRAK/ICG	HARVEY, IL	10/12/1979
CR	ROYERSFORD, PA	10/1/1979
SP	THOUSAND PALMS, CA	7/24/1979
AMTRAK/PLASSER	EDISON, NJ	4/20/1979

UP	RAMSEY, WY	3/29/1979
CR	MUNCY, PA	1/31/1979
LN	FLORENCE, AL	9/18/1978
Railroad	**Location**	**Date**
CR/AMTRAK	SEABROOK, MD	6/9/1978
GCRTA	CLEVELAND, OH	7/8/1977
CR	STEMMERS RUN, MD	6/12/1977
CTA	CHICAGO, IL	2/4/1977
NW	NEW HAVEN, IN	10/19/1976
GCRTA	CLEVELAND, OH	8/18/1976
CR	NEW CANAAN, CT	7/13/1976
PENN CENTRAL	PETTISVILLE, OH	2/4/1976
CTA	CHICAGO, IL	1/9/1976
PENN CENTRAL	WILMINGTON, DE	10/17/1975
MBTA	BOSTON, MA	8/1/1975
ALASKA RR	HURRICANE, AK	7/5/1975
PENN CENTRAL	LEETONIA, OH	6/6/1975
TP	MEEKER, LA	5/30/1975
PENN CENTRAL	BOTANICAL GARDEN, NY	1/2/1975
SLSF	MUSTANG, OK	9/1/1974
MP	COTULLA, TX	12/1/1973
TTCI/PUEBLO	PUEBLO, CO	8/11/1973
SP	INDIO, CA	6/25/1973
TP/MP	TAFT, LA	2/21/1973
ICG	CHICAGO, IL	10/30/1972
BN	MAQUON, IL	5/24/1972
PENN CENTRAL	HERNDON, PA	3/12/1972
IC/IHB	RIVERDALE, IL	9/8/1970
PENN CENTRAL	DARIEN, CT	8/20/1969
NYC	NEW YORK CITY, NY	5/22/1967

APPENDIX

OPEN SAFETY RECOMMENDATIONS RELATED TO POSITIVE TRAIN CONTROL

Recommendation Report

Friday, May 03, 2002
REC:r* STATUS:O* KEYWORD 1:train KEYWORD 2:control

Log Number **R-0643C**

IssueDate **07/29/1993** **LEDGER MT** **08/30/1991**

ON AUGUST 30, 1991, THE EASTBOUND BURLINGTON NORTHERN RAILROAD (BN) FREIGHT TRAIN 602 DEPARTED SHELBY, MONTANA, HEADING SOUTH. WESTBOUND BN FREIGHT TRAIN 603 DEPART GREAT FALLS, MONTANA, PROCEEDING NORTH. BOTH TRAINS WERE ROUTED OVER BN UNSIGNALED SINGLE TRACK LINE BETWEEN SHELBY AND GREAT FALLS. A BRANCH LINE DISPATCHER IN SEATTLE, WASHINGTON, CONTROLLED THE TRAINS' MOVEMENT BY ISSUING TRACK WARRANTS (TWS) THROUGH A COMPUTERIZED TRACK WARRANT CONTROL (CTWC) SYSTEM. AT 5:50 P.M. MOUNTAIN DAYLIGHT TIME AT MILEPOST 85.55 NORTH OF LEDGER, MONTANA, THE TWO TRAINS COLLIDED HEAD ON AT A CLOSING SPEED OF 87 MPH. AFTER IMPACT, FIRE ENSUED FROM SPILLED LOCOMOTIVE DIESEL FUEL, BURNING LOCOMOTIVE UNITS, TWO FREIGHT CARS, AND GRASS. NINE LOCOMOTIVE UNITS AND 22 CARS WERE DESTROYED; 9 CARS WERE DAMAGED. TRACK DAMAGE, EQUIPMENT REPLACEMENT, AND CLEAN-UP COSTS WERE ESTIMATED AT $19 MILLION. THREE CREWMEN WERE KILLED, AND FOUR WERE SEVERLY INJURED.

		Overall Status	Priorit
Recommendation #	**R-93-015**	**OAA**	**CLASS II**

THE NTSB RECOMMENDS THAT THE RAILWAY PROGRESS INSTITUTE: IN CONJUCTION WITH THE FEDERAL RAILROAD ADMINISTRATION AND THE ASSOCIATION OF AMERICAN RAILROADS, ESTABLISH A FIRM TIMETABLE THAT INCLUDE, AT A MINIMUM, DATES FOR FINAL DEVELOPMENT OF REQUIRED ADVANCED TRAIN CONTROL SYSTEM HARWARE, DATES FOR IMPLEMENTATION OF A FULLY DEVELOPED ADVANCED TRAIN CONTROL SYSTEM, AND A COMMITMENT TO A DATE FOR HAVING THE ADVANCED TRAIN CONTROL SYSTEM READY FOR INSTALLATION ON THE GENERAL RAILROAD SYSTEM.

RAILWAY PROGRESS INSTITUTE OPEN - ACCEPTABLE RESPONSE

Log Number **R-0649A**

IssueDate **11/23/1994** **KELSO WA** **11/11/1993**

ON NOVEMBER 11, 1993, ABOUT 12:24 A.M. PACIFIC STANDARD TIME, A BURLINGTON NORTHERN (BN) FREIGHT TRAIN COLLIDED HEAD ON WITH A UNION PACIFIC (UP) FREIGHT TRAIN AT BN MILEPOST 102.8 SOUTH OF THE LONGVIEW JUNCTION SOUTH INTERLOCKING NEAR KELSO, WASHINGTON. AS A RESULT OF THE ACCIDENT ALL FIVE CREWMEMBERS FROM BOTH TRAINS WERE KILLED.

		Overall Status	Priorit
Recommendation #	**R-94-016**	**OAA**	**CLASS II**

THE NTSB RECOMMENDS THAT THE ASSOCIATION OF AMERICAN RAILROADS: IN CONJUNCTION WITH THE FEDERAL RAILROAD ADMINISTRATION, IDENTIFY AND EVALUATE ALL OF THE POTENTIAL BENEFITS OF POSITIVE TRAIN SEPARATION AND INCLUDE THEM IN ANY COST BENEFIT ANALYSIS CONDUCTED ON POSITIVE TRAIN SEPARATION CONTROL SYSTEMS.

ASSOCIATION OF AMERICAN RAILROADS OPEN - ACCEPTABLE RESPONSE

Log Number **R-0671B**

IssueDate **08/28/1997** **SILVER SPRING MD** **02/16/1996**

ABOUT 5:38 P.M. ON 2/16/96, EASTBOUND MARYLAND RAIL COMMUTER (MARC) TRAIN 286 COLLIDED WITH WESTBOUND NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK) TRAIN 29, THE CAPITOL LIMITED, AT MILEPOST 8.55 ON CSX MAIN TRACK NEAR SILVER SPRING, MARYLAND. THE MARC TRAIN WAS OPERATING IN THE PUSH MODE IN REVENUE SERVICE BETWEEN BRUNSWICK , MARYLAND, & WASHINGTON, D.C.; IT CONSISTED OF A LOCOMOTIVE & THREE COMMUTER CARS. THE AMTRAK TRAIN, OPERATING IN REVENUE SERVICE BETWEEN WASHINGTON D.C., & CHICAGO, ILLINOIS, CONSISTED OF 2 LOCOMOTIVES & 15 CARS.

Overall Status **Priorit**

Recommendation # **R-97-026** **OAA**

THE NTSB RECOMMENDS THAT THE CSXT TRANSPORTATION INC.: DEVELOP & INSTALL A POSITIVE TRAIN SEPARATION CONTROL SYSTEM ON TRACK SEGMENTS THAT HAVE COMMUTER & INTERCITY PASSENGER TRAINS.

CSX CORPORATION OPEN - ACCEPTABLE RESPONSE

Log Number **R-0671G**

IssueDate **08/28/1997** **SILVER SPRING MD** **02/16/1996**

ABOUT 5:38 P.M. ON 2/16/96, EASTBOUND MARYLAND RAIL COMMUTER (MARC) TRAIN 286 COLLIDED WITH WESTBOUND NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK) TRAIN 29, THE CAPITOL LIMITED, AT MILEPOST 8.55 ON CSX MAIN TRACK NEAR SILVER SPRING, MARYLAND. THE MARC TRAIN WAS OPERATING IN THE PUSH MODE IN REVENUE SERVICE BETWEEN BRUNSWICK , MARYLAND, & WASHINGTON, D.C.; IT CONSISTED OF A LOCOMOTIVE & THREE COMMUTER CARS. THE AMTRAK TRAIN, OPERATING IN REVENUE SERVICE BETWEEN WASHINGTON D.C., & CHICAGO, ILLINOIS, CONSISTED OF 2 LOCOMOTIVES & 15 CARS.

Overall Status **Priorit**

Recommendation # **R-97-039** **OAA**

THE NTSB RECOMMENDS THAT THE ASSOCIATION OF AMERICAN RAILROAD: ASSIST THE RAILROAD INDUSTRY WITH THE DEVELOPMENT OF POSITIVE TRAIN SEPARATOIN CONTROL SYSTEMS THROUGH A CONTINUING REVIEW OF NONRAILROAD TECHNOLOGY & ASSESS ITS ADAPTABILITY TO RAILROAD COMMUNICATION-BASED CONTROL SYSTEMS.

ASSOCIATION OF AMERICAN RAILROADS OPEN - ACCEPTABLE RESPONSE

Overall Status **Priorit**

Recommendation # **R-97-040** **OAA**

THE NTSB RECOMMENDS THAT THE ASSOCIATION OF AMERICAN RAILROADS: ASSIST THE RAILROAD INDUSTRY WITH THE DEVELOPMENT OF POSITIVE TRAIN SEPARATION CONTROL SYSTEMS BY ACTING AS A CLEARINGHOUSE FOR INFO ON THE STATUS & RESULTS OF PILOT PROJECTS & BY DISSEMINATING THAT INFO TO THE RAILROAD INDUSTRY & THE FEDERAL & PARTICIPATING STATE TRANSPORTATION ORGANIZATIONS.

ASSOCIATION OF AMERICAN RAILROADS OPEN - ACCEPTABLE RESPONSE

Overall Status **Priorit**

Recommendation # **R-97-041** **OAA**

THE NTSB RECOMMENDS THAT THE ASSOCIATION OF AMERICAN RAILROADS: ASSIST THE RAILROAD INDUSTRY WITH THE INSTALLATION & OPERATION OF POSITIVE TRAIN SEPARATION CONTROL SYSTEMS BY MAINTAINING INDUSTRY STANDARDS TO ENSURE OPEN ARCHITECTURE & AN INTEROPERABILITY OF EQUIPMENT FOR TRAIN CONTROL SYSTEMS.

ASSOCIATION OF AMERICAN RAILROADS	OPEN - ACCEPTABLE RESPONSE

Log Number **R-0692**

IssueDate **06/12/2001** **BRYAN OH** **01/17/1999**

ABOUT 1:58 A.M. EASTERN STANDARD TIME ON 1/17/99, THREE CONSOLIDATED RAIL CORPORATION (CONRAIL) FREIGHT TRAINS OPERATING IN FOG ON A DOUBLE MAIN TRACK WERE INVOLVED IN AN ACCIDENT NEAR BRYAN, OHIO. WESTBOUND MAIL-9, TRAVELING NEAR MAXIMUM AUTHORIZED SPEED ON TRACK NO. 1, STRUCK THE REAR OF A SLOWER MOVING WESTBOUND TRAIN, TV-7, AT MILEPOST (MP) 337.22. THE COLLISION CAUSED THE DERAILMENT OF THE 3 LOCOMOTIVES UNITS AND THE FIRST 13 CARS OF MAIL-9 AND THE LAST 3 CARS OF TV-7. THE DERAILED EQUIPMENT FOULED THE NO. 2 TRACK AREA AND STRUCK THE 12TH CAR OF TRAIN MGL-16, WHICH WAS OPERATING EASTBOUND ON THE ADJACENT TRACK. THE IMPACT CAUSED 18 CARS IN THE MGL-16 CONSIST TO DERAIL. THE ENGINEER AND CONDUCTOR OF MAIL-9 WERE KILLED IN THE ACCIDENT. THE CREWMEMBERS OF TV-7 AND MGL-16 WERE NOT INJURED. TOTAL ESTIMATED DAMAGES WERE $5.3 MILLION.

		Overall Status	Priorit
Recommendation #	**R-01-006**	**OAR**	

THE NTSB RECOMMENDS THAT THE FEDERAL RAILROAD ADMINISTRATION: FACILITATE ACTIONS NECESSARY FOR DEVELOPMENT AND IMPLEMENTATION OF POSITIVE TRAIN CONTROL SYSTEMS THAT INCLUDE COLLISION AVOIDANCE, AND REQUIRE IMPLEMENTATION OF POSITIVE TRAIN CONTROL SYSTEMS ON MAIN LINE TRACKS, ESTABLISHING PRIORITY REQUIREMENTS FOR HIGH-RISK CORRIDORS SUCH AS THOSE WHERE COMMUTER AND INTERCITY PASSENGER RAILROADS OPERATE.

FRA

Log Number **R-0695**

IssueDate **12/20/2001** **Syracuse NY** **02/05/2001**

At about 11:40 a.m., eastern standard time, on February 5, 2001, eastbound Amtrak train 286, with 100 passengers and 4 crewmembers, struck the rear of eastbound CSX Transportation (CSXT) freight train Q620 on the CSXT railroad near Syracuse, New York. On impact, the lead Amtrak locomotive unit and four of the train's five cars derailed. The rear truck of the last car of the 92-car CSXT freight train derailed, and the car lost a portion of its load of lumber. At the time of impact, the passenger train was traveling 35 mph; the freight train was traveling 7 mph. The accident resulted in injuries to all 4 crewmembers and 58 of the passengers aboard the Amtrak train. No CSXT crewmember was injured. A small amount of diesel fuel spilled from the fuel tank on the lead Amtrak locomotive unit, but no fire resulted. Total damages were estimated to be about $280,600.

		Overall Status	Priorit
Recommendation #	**R-01-021**	**OAR**	

The NTSB recommends that the Federal Railroad Administration: Evaluate the applicability to U.S. operations of the safety requirements established by Transport Canada for lone-engineer operation on the Quebec North Shore & Labrador Railway, and implement any found to have interim utility for U.S. passenger trains that operate in areas now lacking a system of positive train control.

FRA

APPENDIX

Source: Los Angeles Times – April 28, 2002

Safer Railroad Braking System Delayed by Cost, Technical Concerns

By EVAN HALPER
Times Staff Writer

April 28 2002

The technology has been around for nearly two decades.

An automatic braking system can link passenger and freight trains to rail side warning signals, triggering an emergency stop if trains are on a collision course.

In addition to improving safety, the technology could boost railroad efficiency as much as 30%, allowing trains to travel faster and closer together. Federal officials investigating Tuesday's fatal crash of a freight train and Metrolink commuter train in Placentia said the accident would have been prevented had the system been in place.

But the rail industry and federal officials who regulate the rails have resisted, saying the $3-billion cost is too high. Moreover, they say the technology has problems.

Metrolink officials agree, even after Tuesday's crash.

"There are an incredibly complicated set of issues that still need to be addressed with this technology," said Metrolink spokesman Francisco Oaxaca.

As a result of the resistance, only two U.S. rail lines have the braking systems, to the frustration of regulators who have been calling for their mandatory use nationwide since the mid-1980s.

"Tuesday's accident was another one where not having this was a factor," said Keith Holloway, a spokesman for the National Transportation Safety Board. "When it keeps coming back up again and again that this could have been an issue in accidents, we need to address it."

Investigators believe the Placentia crash was caused when the crew of a Burlington Northern Santa Fe freight train ran past two warning signals, plowing into the double-decker passenger train. Two passengers died and more than 100 were injured. The freight engineer told Placentia police he couldn't see the signals because the morning sun blinded him.

The NTSB--which handles safety investigations for the federal government, but lacks regulatory authority--has pressured the Federal Railroad Administration for years to require the automatic brakes. Yet rail administration officials maintain the cost must come down before they can force companies to use it. The rail industry hopes to create a system compatible across U.S. rail lines. Such tests have been going on for at least 15 years, and at one time included a pilot program in Southern California with Burlington Northern Santa Fe.

A central question in the debate is whether spending money on the computerized brakes is the best way to save lives. Only a fraction of train accidents are the result of train-on-train collisions. Most are caused by cars stuck at road crossings or pedestrians on the tracks.

"It is difficult to put a value on human lives, but to a certain extent the railroad industry has begun to do that," said Tom Sullivan, an Oakland-based transportation technology consultant. "In this case, it costs them about $3 [million] to $5 million a life to install these systems."

Railroad companies say they are waiting for the signaling industry to produce "off the shelf'" products that would make the technology cheaper and able to be used compatible across their rail networks.

"What good is it if a locomotive from L.A. won't work when it interchanges onto an eastern railway?" said Warren Flatau, spokesman for the Federal Railroad Administration. "Those things are being worked out. It takes time to build consensus."

So in the age of cell phones and Palm Pilots, train operators continue to rely on technology rooted in the 19th century. And the industry sees no reason for immediate change, citing few train collisions.

The computerized brakes are in place only on a high-speed Amtrak corridor in the Northeast and an Amtrak line in Michigan.

Tests on a commuter line in New Jersey and a freight line in Alaska are expected to begin soon.

But the most widely anticipated test will take place in Illinois, where the railroad industry and government agencies are spending $35 million to install a satellite-linked braking system on 123 miles of track shared by freight and passenger trains.

Trains on that track will be equipped with computers linked to a satellite system and the railroad operations center. If the train is on a collision course, an alarm will sound in time for conductors to stop the trains. If they do not, and a crash appears imminent, the computer stops the train. Dispatchers will know the location of every train within a meter.

The system also will sense whether a train is going too fast for track conditions and will slow it

down. The computer can sense the train's location in relation to railroad track workers and will be able to warn the conductor and the workers.

Trains currently run on a "block" system in which no more than one train can be on a section of track. Signal lights tell engineers when to yield to trains ahead of them. This has caused long delays on tracks shared by freight and commuter trains.

Under the automated system, delays would be reduced because computer monitoring allows trains to travel closer together, said Francesco Pellegrino a scientist with Lockheed Martin, which was contracted to build the equipment.

Trains also would be permitted to exceed the 79 mph federal speed limit and go as fast as 110 mph.

The industry fears investing in technology that may flop. Tom White, a spokesman for the American Assn. of Railroads, says freight companies have experimented with more than a dozen variations of positive control and continue to see flaws. "It can be more complicated than you think," he said.

Meanwhile, the NTSB continues to send letters to the railroad administration expressing its disappointment that the braking systems have not been mandated. The board put the systems on its "most wanted" list in 1990, where they remain today.

A letter the board sent to the rail administration in June put it bluntly: "Without the installation of [the] systems, preventable collision accidents will continue to occur."
